Dec 2nd, 12:00 AM

Pesticide Use and Water Quality

Rich Pope
Iowa State University

Mary Skopec
Iowa Department of Natural Resources

Jim Ellerhoff
Iowa Department of Agriculture & Land Stewardship

PESTICIDE USE AND WATER QUALITY

Rich Pope
Extension Program Specialist
Department of Entomology, Iowa State University

Mary Skopec
Iowa Geological Survey
Iowa Department of Natural Resources

Jim Ellerhoff
Pesticide Bureau
Iowa Department of Agriculture & Land Stewardship

Overview

Understanding use rates and use patterns of pesticides is valuable to the agricultural industry for manufacturers, registrants, regulatory agencies, environmental interests and pesticide end-users. There are several sources of data, including surveys of pesticide users, monitoring of pesticide detections in the environment, and indirect measures including tracking pesticide sales. The Iowa Groundwater Protection Act of 1987 directed the Iowa Department of Agriculture and Land Stewardship (IDALS) to collect pesticide sales data from pesticide dealers. The dollar sales data, which is confidential business information, is being used to calculate approximate pounds of active ingredients for pesticides which might impact surface or ground water quality. The calculated pounds data for selected pesticides is then provided to the water quality researchers at the Iowa Geological Survey (IGS) of the Iowa Department of Natural Resources and at Iowa State University Extension. The dataset presented here using two methods, one by ISU Extension and the other by the Geologic Survey Bureau, was gathered by the Iowa Department of Agriculture and Land Stewardship Pesticide Bureau and was compiled with assistance from the Iowa Geologic Survey Bureau of the Iowa Department of Natural Resources. These use rate patterns are helpful in crafting management plans to reduce or avoid environmental contamination from specific pesticides.

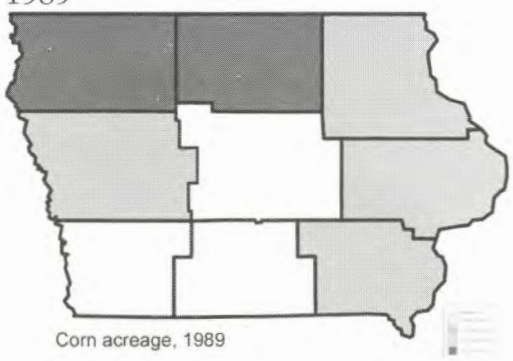
Atrazine as an example—ISUE, regional use rates

Atrazine is a product that is used widely in Iowa in corn production, and has been a key management tool for over 50 years. In addition, atrazine has drawn public interest because it is sometimes found at low levels in ground and surface waters, which is of concern to water resource users in Iowa and elsewhere.

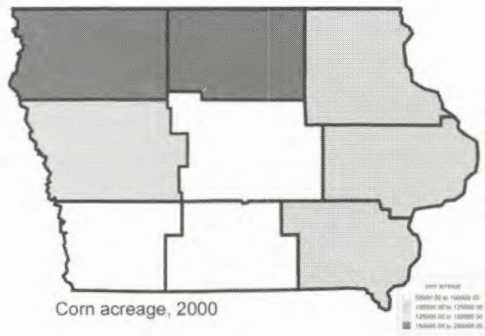
Because corn production is not uniform throughout Iowa, examining atrazine sales simply by charting data from county points of sale can be misleading because of two biases. First, use of any agricultural pesticides in Iowa often occurs in counties other than the county of sale. In addition, counties or regions where corn production is more intensive would be likely to generate higher sales than other less corn intensive areas. County by county indicated sales of atrazine are shown for both 1989 and 2000. For discussion purposes, yearly data is presented that couples crop reporting district indicated sales with a representation of the sales per planted corn acre. The intent is to attempt to defeat the bias in the presentation caused by posting raw sales data.

A final introductory point is that there are significant regional differences in the applicability of atrazine because of regional soils, climate, and cultural differences. Farms in north central Iowa, for example, are usually grown in a corn-soybean rotation, with little continuous corn. Also, soils tend to be higher pH, which limits the use of atrazine. There is also variation between regions based on the prevalence of specific weed species that atrazine is particularly useful in controlling, including wirestem muhley (*Muhlenbergia frondosa*) and quackgrass (*Elymus repens* [*Elytrgia repens*]). As shown below, Iowa corn acreage by crop reporting district has not changed significantly from 1989 to 2000 (There were no significant changes for 2001 and 2002 either).

1989



2000

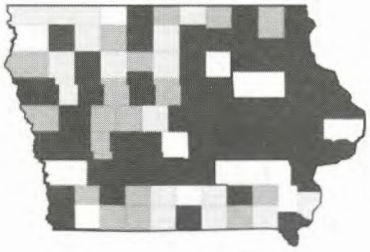


Both maps are keyed the same:
Clear -- 50,000 to 100, 000 acres
Grey -- 100,000 to 125,000 acres
Dark grey – 150,000 to 200,000 acres

Atrazine sales by county, 1989 and 2000: county:

1989

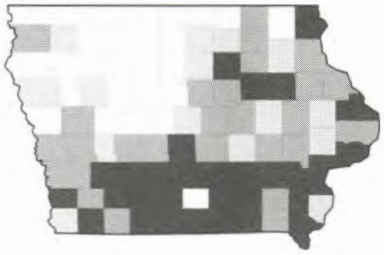
2000



Sales in pounds per corn acre by

1989

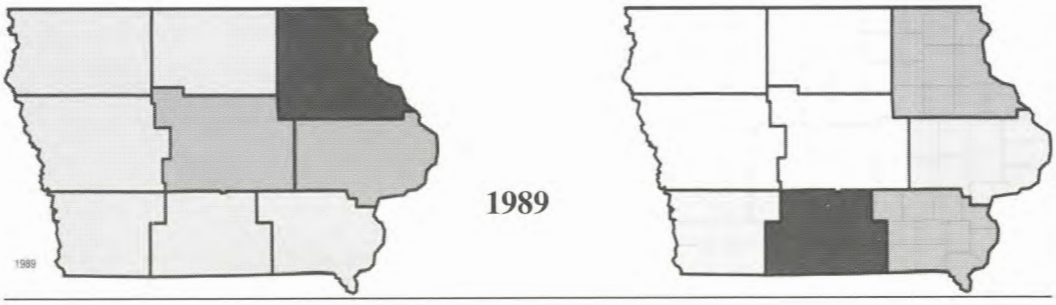
2000



Atrazine sales by Crop Reporting District (CRD), and sales per corn acre by CRD.

Left column: Total indicated sales; pounds
White – 0 to 500,000 pounds
Light grey – 500,000 to 75,000 pounds
Dark gray – 750,000 to 1,000,000 pounds
Black – 1,000,000 to 2,000,000 pounds

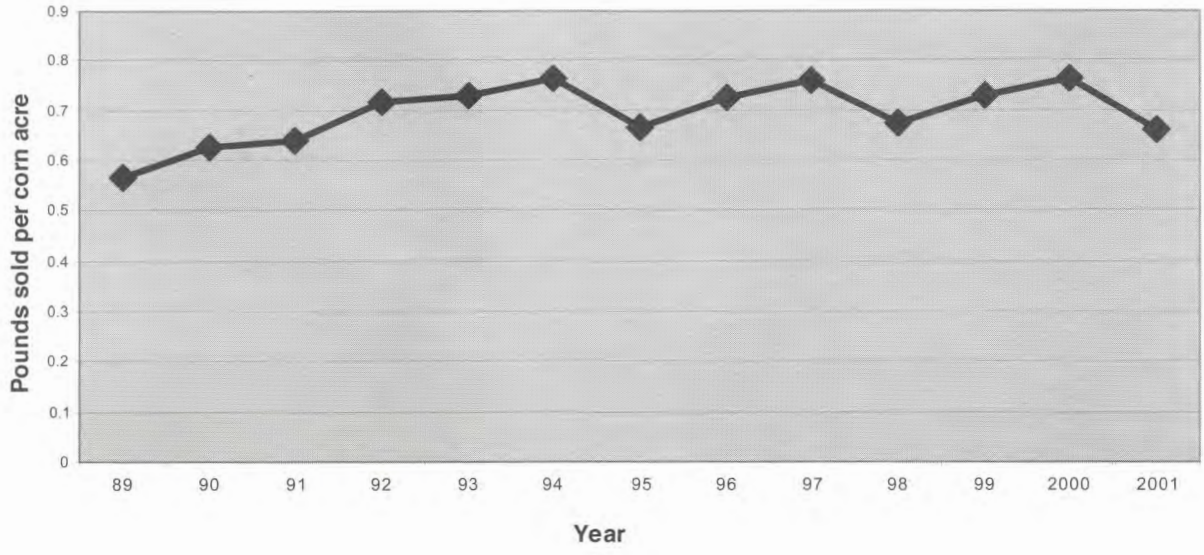
Right column: sales per corn acre
White – 0 to 0.5
Light grey – 0.5 to 0.75
Dark grey – 0.75 to 1.0
Black – greater than 1.0



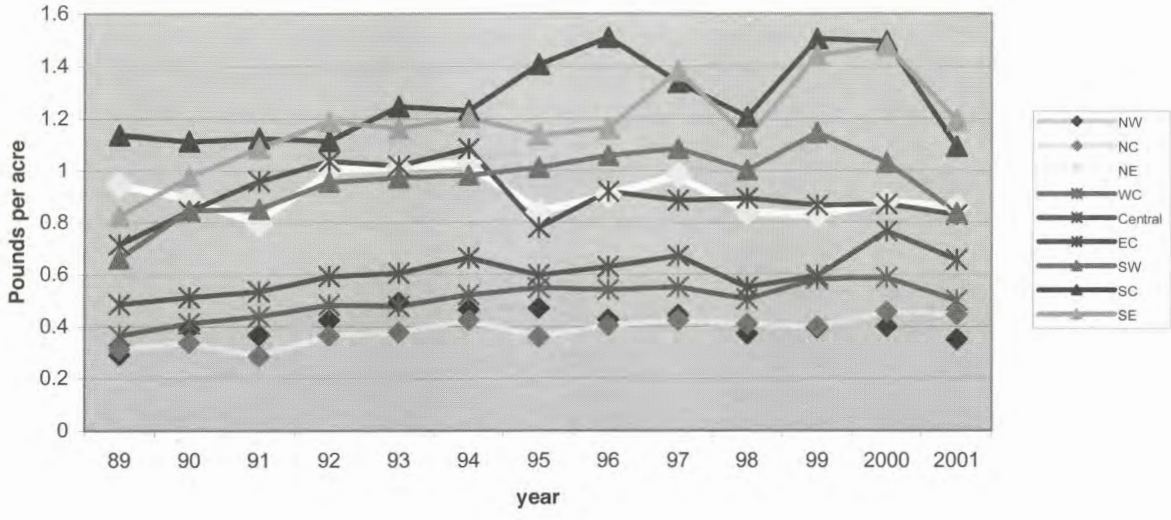
1989

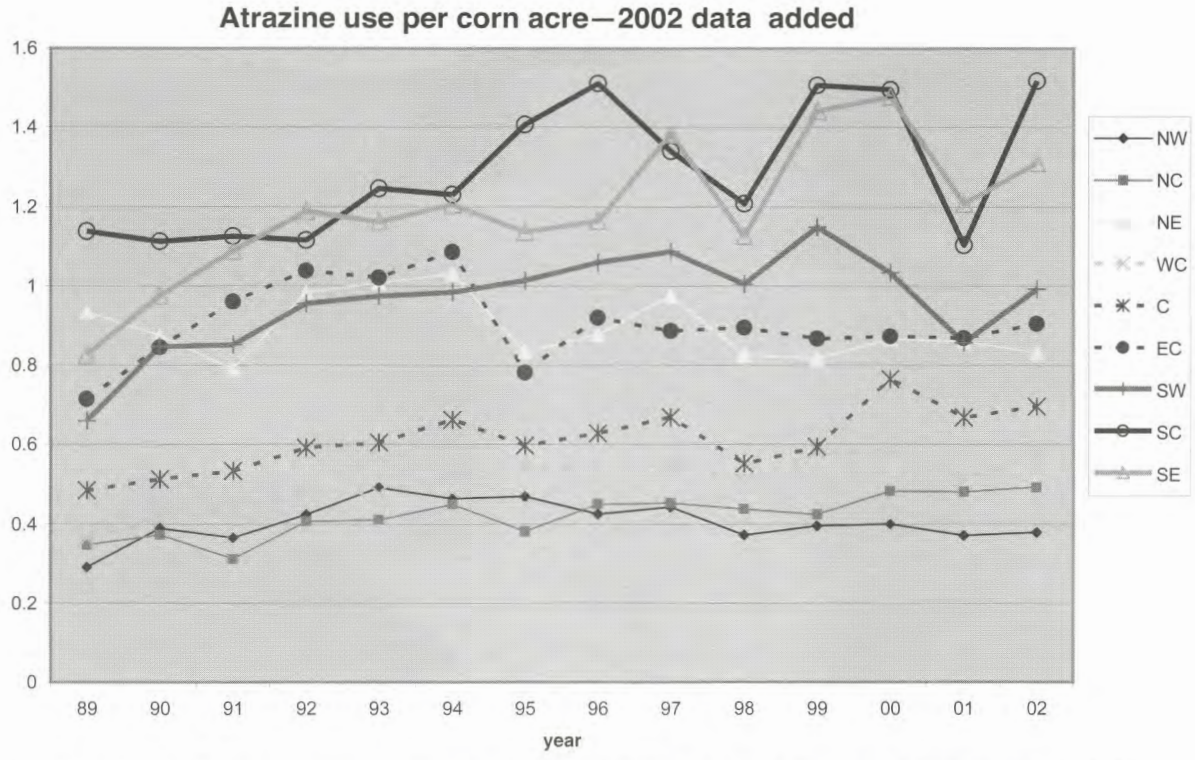
2002

Atrazine sold per acre--statewide



Atrazine sold per corn acre--9 Iowa crop reporting districts





Atrazine use in Iowa, measured in terms of total pounds sold, seemed to increase slightly between 1989 and about 1992, and then has stayed roughly constant. When atrazine use is viewed from the perspective of product sold per corn acre, the three southern tiers of Iowa are shown as significantly higher than the rest of Iowa. The statewide decline in per corn acre use did decline in the 2001 crop year, however in 2002, use rebounded. Because the dataset is smaller in the southern crop reporting districts, more fluctuation in use from year to year is not surprising.

Since about 1992, per acre-use has not changed within a reporting district to any apparent level. That might reflect a changing role of atrazine in Iowa agriculture from being a sole ingredient option to being a tank-mix partner. Much of that change occurred in the early 1990s and has continued.

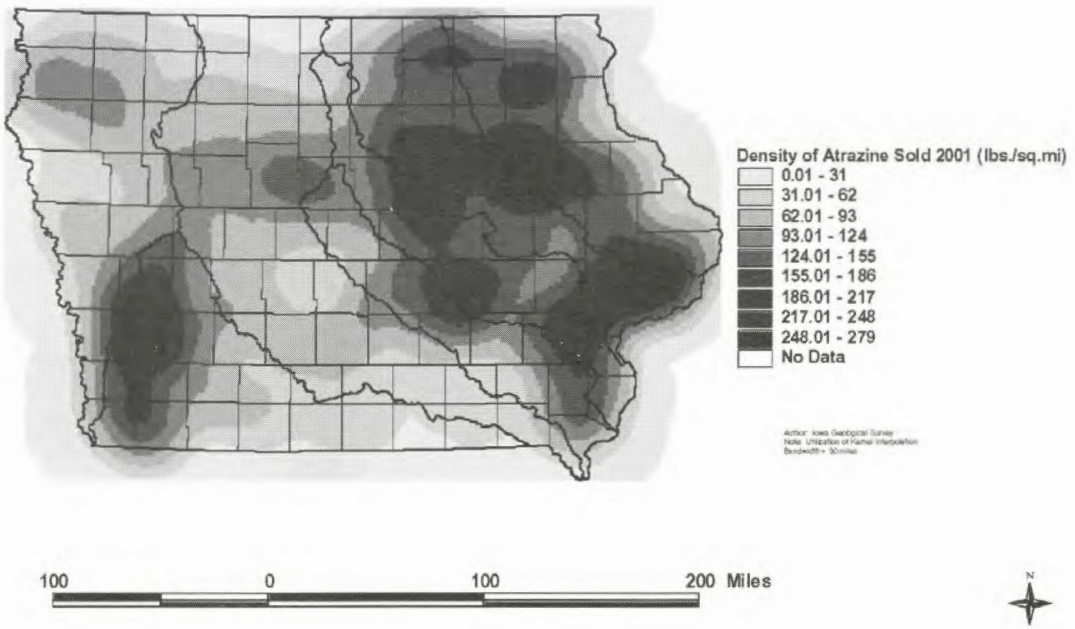
Atrazine as an example: IGSB and points of sale

The IGS uses Geographic Information System computer software to distribute the data from the dealer points of sale. The result is a map of Iowa with the counties shown and areas of the state shaded for five thresholds of active ingredient pounds. The pattern illustrates the approximate areas of higher to lower uses of a given pesticide active ingredient.

The IGS has also developed the IAPEST database that contains all of the documented detections of pesticides in surface and ground water. The results from the on-going water monitoring analysis is used to develop pesticide trends and compared to the sales data of pounds of pesticides. The IAPEST database has over 54,239 data points from 5,851 sites in Iowa. Over 281 different pesticide active ingredients are covered in the database.

IDALS with funding from the U.S. Environmental Protection Agency Region VII and cooperation with Iowa State University Extension and the Iowa Geological Survey has been able to conduct eight training sessions for certified crop advisors. The workshops have addressed pesticides and their relationships to water quality. The GIS maps, IAPEST data, and instruction on geology, hydrology, landforms, soils, and how pesticides interact in the environment have been presented in these workshops.

Interpolated Density Surface of Total Atrazine Sales in 2001



Interpolated Density Surface of Total Atrazine Sales in 1994